

**STATE OF CALIFORNIA
STATE WATER RESOURCES CONTROL BOARD**

**INFORMATIONAL PROCEEDING TO DEVELOP FLOW CRITERIA FOR THE DELTA
ECOSYSTEM NECESSARY TO PROTECT PUBLIC TRUST RESOURCES**

SUMMARY OF TESTIMONY: ENVIRONMENTAL DEFENSE FUND

Environmental Defense Fund (EDF) provides this summary of the testimony that we are submitting in this proceeding, EDF 1, TBI 1 through TBI 4, and AR 1. EDF is also submitting as EDF 2-3, our Statements of Qualifications for potential witnesses.

The Bay Institute of San Francisco (TBI), in conjunction with a consortium of environmental organizations including EDF, has developed a comprehensive set of flow criteria for the Bay-Delta Estuary for purposes of this informational proceeding. As documented in the testimony, these flow criteria are founded on the extensive scientific data and literature available regarding the Bay-Delta ecosystem and related fisheries. The flow criteria set forth in this testimony are reasonably likely to first restore, and then maintain, the Estuary's public trust resources to viable and self-sustaining levels for the long-term. **On this basis our organizations recommend that the State Board adopt these flow parameters as its public trust flow criteria for the Estuary pursuant to The Sacramento-San Joaquin Delta Reform Act of 2009.** We recognize that these flow criteria will not affect any water right immediately upon adoption, and that subsequent and full adjudicatory proceedings would be required before the State Board could translate these flow criteria into enforceable permit conditions.

Separately, EDF engaged Stillwater Sciences (Stillwater) to supplement the TBI effort by reviewing the ecosystem restoration analyses conducted by public agencies over the last two decades as well as the primary literature. Stillwater has prepared a functional approach to public trust flow analysis using selected focal species that examines both proximate and ultimate functions of various flow parameters in the service of accomplishing desired ecosystem objectives (e.g., floodplain inundation, flow direction, salinity, etc.) and linkages to public trust resources.

KEY ISSUES: RESPONSES TO SWRCB QUESTIONS

1. KEY INFORMATION AND RELATED ISSUES

a. Best Available Scientific Information

Throughout the TBI and Stillwater submittals, the term "best available scientific information," as used in the statute, refers to the large body of scientific literature, data and studies relevant to the Bay-Delta ecosystem, specific fish species and other public trust resources of the Estuary, with an emphasis on the more recent and rigorously peer-reviewed of these studies. All of the EDF, TBI and AR testimony cite extensively the scientific data and studies on which the Board should rely in establishing the public trust flow criteria.

b. Appropriate Evidentiary Standard for Establishing the Public Trust Flow Criteria; The Board should not adopt a “Certainty” Standard

The SWRCB seeks comment about the “level of scientific uncertainty regarding” the available scientific information. First, as discussed in the testimony, the body of scientific data, evidence and other information regarding the public trust flow needs of the Delta and related fisheries is extensive and robust; the Delta is one of the more intensively studied environments in the world. Second and more critically, “scientific certainty” is not an appropriate standard for the Board’s determination, and would be an improper and impractical standard for the Board to adopt in this (or any other) proceeding. We appreciate and respect the tendency in scientific circles to seek out and rely upon data establishing definitive mechanistic and causal relationships. We also agree that where such a direct causal link exists, that relationship should be used to guide the development of flow criteria.

However, for purposes of a public policy proceeding such as this one, the absence of evidence establishing specific mechanistic relationships does not permit the view that there is no sound scientific basis on which to base flow criteria, or that such criteria should await more “certain science.” The absence of mechanistic explanations did not prevent centuries of agricultural advances pre-dating our understanding of biochemistry, or many other examples of excellent, evidence-based policy making in other areas. Assuming that flows are unimportant because their functionality has not been established at a level meeting the strict standard of scientific certainty is unacceptable from either scientific or public policy perspective and would certainly be inconsistent with the Board’s public trust obligations.

c. Public Trust Flows Indicated By the Scientific Information

Many factors affect the health of public trust resources, but the relationship between flows and viability of public trust species is probably the strongest biological signal in the estuary. There is no compelling evidence that anything other than restoration of adequate flows can fuel restoration of public trust resources. Flow restoration may not be sufficient in and of itself to fully protect public trust resources due to additional stressors which also must be mitigated. However, without restored flows protection of public trust resources will not be possible. In other words, adequate flows are a necessary, if not sufficient, condition of public trust protection.

Our flow recommendations consist of criteria for Delta outflow, Sacramento River inflow, San Joaquin River inflow, and Delta hydrodynamics, organized by season and water year type. They are designed to restore and/or maintain the viability of one or more public trust resources based on known causal, correlative and/or other relationships between flow and viability attributes (*see* the response to Issue #2). These recommendations are detailed in TBI Exh. 1, and further supplemented in EDF Exh. 1.

2. APPROPRIATE METHODOLOGY

TBI’s recommended methodology for development of the flow criteria is set forth in detail in TBI Exh. 1. Stillwater has proposed a complementary approach focusing on proximate and ultimate function in EDF Exh. 1. The Board’s public trust flow determinations should be based upon viability criteria for representative species in the Estuary. “Viability” as used here means maintaining appropriate levels of four characteristics that equate to the persistence of populations and estuarine ecosystems: (1) abundance ; (2) distribution; (3) diversity; and (4) productivity.

Abundance:

- More abundant populations are less vulnerable to disturbances and risk of extinction .

- The relationship between abundance and flow is one of the strongest and most persistent relationships observed in the San Francisco estuary.

Distribution:

- More widely distributed populations are less vulnerable to catastrophic events and risk of extinction.
- Flows positively affect spatial distribution by facilitating the movement of organisms and by making suitable habitat available through floodplain inundation, salinity gradient, and other mechanisms.

Diversity:

- Species and populations that are both more genetically diverse, and more diverse in life history patterns, are more resilient to environmental change and less at risk of extinction.
- Maintaining the high variability in flows that characterize estuaries helps preserve the genetic and life history diversity of public trust resources.

Productivity:

- The potential of a particular species for population growth allows it to adjust to changing conditions in a dynamic estuary.
- Large-scale hydrologic alterations can reduce or even prevent population growth.

Performance targets have been identified for the viability of various public trust resources, and flow criteria intended to achieve these targets developed based on the best available scientific information and functionality.

3. SOURCE OF FLOWS

Determining the public trust flow needs of the Delta Estuary requires full consideration of inflows from the Sacramento and San Joaquin River systems. The TBI, Stillwater and American Rivers testimony all describe and analyze the critical connection between Delta outflow and inflows to the Estuary. The Board should address this issue by including clear recommendations for inflow for both the San Joaquin and Sacramento Rivers in its public trust determination.

The timing, duration, frequency, and source of flows into the Delta have an important effect on the protection of public trust resources, independent of any consideration of flow conditions in areas upstream of the Delta that fall outside the scope of this proceeding. These inflows literally *create* the habitat in the Delta that public trust species use for spawning and rearing and the migratory cues and drivers that anadromous species use to travel between ocean, riverine, and headwaters habitats. The relative contribution of the inflows that cumulatively produce Delta outflows has enormous consequences for the habitats (e.g., floodplains, waters with sufficient flow and turbidity) available to species in the Delta.

4. SCIENTIFIC UNCERTAINTY

As discussed above, the absence of scientific certainty is not the same as a lack of sound science. In developing its proposed flow criteria, the Board should adopt the 4-tiered hierarchy (discussed in TBI Exh.1) with regard to prioritizing the best available scientific information to guide development of the Board's flow criteria: (1) mechanistic explanations; (2) statistically significant correlations; (3) historic flows associated with more productive periods; and (4) unimpaired flows. While some of this data is arguably stronger or more "certain" than others, all of the evidence cited in the EDF and related testimony meets the "best available scientific information" standard, and the Board would be remiss to ignore or discount it. We concur with American Rivers' observation that the relevant test is whether the flow

criteria are supported by substantial evidence in the record, not whether the evidence is certain as to the biological response of a given species.

Because this proceeding will not result in regulatory decisions or permits, this is not the proceeding in which the Board should develop an adaptive management regime although the identification of targets for protection and restoration of public trust resources is a priority for developing an adaptive management program.

5. REASONABLE EXPECTATIONS

The legislature has given the Board a reasonable task in a reasonable timeframe. Much if not all of the science and evidence at issue has been generated by public agencies and/or their consultants and is known to the Board and its staff, which is intimately familiar with Bay-Delta issues. The direction was not to reinvent the wheel, but rather to synthesize the available information.

TESTIMONY BY PANEL TOPIC

1. Hydrology

The current Delta hydrograph (i.e., the timing, duration and magnitude of inflows, outflows and in-Delta circulation) has been dramatically altered over time by storage, diversions and exports. These flow alterations correlate with declines and poor conditions of pelagic and anadromous fish species in the Delta. Flows pursuant to these criteria should support food web and production, critical habitat for each species, including complex channel form and seasonal access to floodplains, suitable temperature, turbidity, and other water quality conditions; and velocity and other migratory cues.

2. Pelagic Fish

The testimony demonstrates that flow criteria should specify winter-spring flows which: (i) historically correlated with positive population growth at least 50% of the time, and (ii) provide for seasonal floodplain inundation. The criteria should specify fall flows that result in X_2 location less than 80 km.

3. Anadromous Fish

The testimony proposes flow criteria, varying by applicable season, mostly winter-spring, to provide sufficient depth, temperature, and continuity of flows for upstream migration passage for spawners, rearing habitat in seasonally inundated floodplains and channel margins, and outmigration passage for juveniles.

4. Other Stressors

The testimony establishes the importance of specifying flows which address other stressors, including loss of floodplain habitat, predation by non-native fish, impairment of shallow-water habitat by exotic aquatic vegetation, and toxic contaminants. Strategies to address these or other stressors should, of course, include non-flow measures as well.

5. Hydrodynamics

The testimony proposes flow criteria to address reverse flows in Old and Middle Rivers as well as other hydrodynamic conditions that contribute to substantial entrainment of fish within the Delta.